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ABSTRACT

It is noted that calculator usage is increasing and that little information was found on the effect of calculators on learning mathematics in elementary school. The activities described and included are intended to be examples of ways in which calculators may be used with existing curriculum materials. It is assumed that each teacher would select, modify, and develop activities with the best interest of children and the goals of the existing instructional program in mind. The document has been prepared to: (1) stimulate the use of calculators in the elementary grades; (2) provide teachers with "starter" ideas, and (3) provide suggestions for dealing with concepts that arise in the course of instruction with calculators. Samples of survey instruments designed to assess student opinions are provided. All examples of worksheets and student activities are noted according to the skill or area they are designed to promote. Brief guidelines for using calculators and notes on classroom management and calculator use are also included. (MP)

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CESM

CALCULATORS IN ELEMENTARY SCHOOL MATHEMATICS

TEACHER RESOURCE PACKET

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SE039384

CESM
Resource Packet
for
Teachers

I. Introduction

A. Purpose

Calculator usage in our society is increasing and little information is available on the effect of calculators on learning mathematics in the elementary school. The activities described and included in this packet are examples of ways in which calculators may reasonably be used with the existing curriculum materials. These activities have not been prepared as prescriptions for your use of calculators. It is assumed that each individual teacher will select, modify and develop activities with the best interest of the children and the goals of the existing instructional program in mind. This packet has been prepared to:

1. Stimulate the use of calculators for mathematics learning and instruction in the elementary grades.

2. Provide teachers with "starter ideas" for the use of calculators in teaching elementary school mathematics.

3. Provide suggestions to teachers for dealing with mathematical concepts which arise in the course of instruction because of the use of calculators.

4. Provide an annotated bibliography of calculator related resources available to elementary school mathematics teachers.

B. Guidelines for use of calculators

It is important to be able to determine when using the calculator for mathematics instruction is apt to be advantageous. To help in making these judgements it is useful to review the properties and characteristics of calculators so that the instruction can capitalize on these characteristics. A list of the characteristics of calculators follows:

1. Fast

2. Accurate

3. Increased computing power

4. Simple to operate

5. Convenient

6. Motivating

If any of these characteristics are desirable and consistent with the goals of the lesson then the calculator would probably provide an advantage. Or a general rule -- use the calculator for teaching and learning mathematics unless there is a good reason not to.

C. Classroom management and calculator use

Each student should fill out a registration form which includes name, grade, teacher, date, and registration number for the calculator. Each child should put his name on the piece of paper provided, cut it out and tape it on the space on the front of the TI 1000 just below the red display shield.

The children should be instructed to double check that their calculator is turned off when it is not in use. It is suggested that a system of cubby holes be available for children to put their calculators in when not in use.

The batteries can be replaced by using a key or other rigid object to remove back plate. The batteries should last for 30-50 hours of use. When the battery is low the calculator will give strange results.

PACKET

PART I

C E S M

CALCULATORS IN ELEMENTARY SCHOOL MATHEMATICS

WORKSHOP

OCTOBER 1977

BY

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Date: _____ Name: _____

Example: For each pair of words below place an X on the blank that best tells how you feel about--

SNOW

like ___:_X_:___:___:___ hate

cold _X_:___:___:___:___ hot

work ___:___:_X_:___:___ play

These responses would indicate that the person likes snow but is not crazy about it. The person thinks snow is very cold and that snow means some work and some play.

Directions: For each pair of words below place an X on the blank that best tells how you feel about--

MATH

beneficial ___:___:___:___:___ harmful

passive ___:___:___:___:___ active

understandable ___:___:___:___:___ mysterious

frill ___:___:___:___:___ necessary

deep ___:___:___:___:___ shallow

bad ___:___:___:___:___ good

changing ___:___:___:___:___ constant

tool ___:___:___:___:___ toy

strange ___:___:___:___:___ familiar

weak ___:___:___:___:___ strong

simple ___:___:___:___:___ complicated

confining ___:___:___:___:___ expanding

sad ___:___:___:___:___ happy

brave ___:___:___:___:___ scared

slow ___:___:___:___:___ fast

crutch ___:___:___:___:___ tool

boring ___:___:___:___:___ exciting

jump in ___:___:___:___:___ hold back

hard ___:___:___:___:___ easy

more ___:___:___:___:___ less

Example: For each pair of words below place an X on the blank that best tells how you feel about—

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work ___:___:_X_:___:___ play

These responses would indicate that the person likes snow but is not crazy about it. The person thinks snow is very cold and that snow means some work and some play.

Directions: For each pair of words below place an X on the blank that best tells how you feel about—

CALCULATORS

beneficial ___:___:___:___:___ harmful

passive ___:___:___:___:___ active

understandable ___:___:___:___:___ mysterious

frill ___:___:___:___:___ necessary

deep ___:___:___:___:___ shallow

bad ___:___:___:___:___ good

changing ___:___:___:___:___ constant

tool ___:___:___:___:___ toy

strange ___:___:___:___:___ familiar

weak ___:___:___:___:___ strong

simple ___:___:___:___:___ complicated

confining ___:___:___:___:___ expanding

sad ___:___:___:___:___ happy

brave ___:___:___:___:___ scared

slow ___:___:___:___:___ fast

crutch ___:___:___:___:___ tool

boring ___:___:___:___:___ exciting

jump in ___:___:___:___:___ hold back

hard ___:___:___:___:___ easy

more ___:___:___:_8_:___ less

CESM
Teacher Background
Information

Directions: Fill in the circle beneath the appropriate responses:

Grade Level	K	1	2	3	4	5	6
	O	O	O	O	O	O	O

Age	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60	over 60
	O	O	O	O	O	O	O	O	O

Sex	Male	Female
	O	O

How many years have you been teaching elementary school?

None	1-3	4-7	8-11	12-15	16-19	20-23	24-27	28-31
O	O	O	O	O	O	O	O	O

32-35	36-39	over 40
O	O	O

How many college credits do you have in mathematics?

O semester hours or O quarter hours

(Check One)

None	1-3	4-7	8-11	12-15	16-19	20-23	over 23
O	O	O	O	O	O	O	O

Is there a calculator at your home?

Yes	No
O	O

How often do you use the calculator?

Frequently	Occasionally	Seldom	Never
O	O	O	O

OSU

(Name)

CALCULATOR REGISTRATION

Instructions:

A. Fill in the information asked for on lines 1,2,3, and 4 below.

B. Print your name in the box at the upper right hand corner of this paper.

C. Cut out the box with your name on it.

D. Tape it on the front of your calculator over the gold colored space that has TI-1000 on it.

1. NAME _____
   (First) (Last)

2. GRADE _____ TEACHER _____

3. DATE _____ _____ _____
   (Month) (Day) (Year)

4. FROM BACK OF CALCULATOR:

Serial No.

Counting

To count by one's

Press: 1,+,=,=,=,=,...

1. Count to 100 by one's
   Purpose: Reinforce Counting
   Size of 100 (requires 100 button pushes)
   Illustrate repeated addition
   Observe Numeration system patterns

2. Can you make the calculator count by two's? (2,+,=,=,...) Do you reach 100 sooner? Let's race to 100 or more. Group A count by Two's, Group B count by Three's. Go! (Group is done when everyone in group has exceeded 100). Which group finished first. Why?
   Purpose: Reinforce multiples of 2 and 3
   Illustrate repeated addition
   Note difference in time in counting by 2's and 3's. (relate to ratio?)
   Observe Numeration system patterns

Counting

3. Count by Five's, Ten's.

4. Count to One Thousand by One's.
   How long do you think it will take?

   Let's check.
   Purpose: Reinforce Counting
   Size of 1000
   Observe Numeration system patterns

5. Extras:
   Count by Nine's and describe the patterns.
   Make up your own counting patterns.

6. Count to Ten by one-tenth's (.1).
   (.,1,+,=,=,...)

7. Count to Ten by one-hundredth's (.01). How long do you think it will take?

Counting

8. You have been doing repeated addition. Can you also do repeated multiplication? What happens?
Compare:

2, +, =, =, =, . . .

with

2, x, =, =, =, . . .

(What does the flashing display mean?)

Computing

Solve the following problems:

1. 42 + 37 = ☐

2. 376 - 197 = ☐

3. 17 x 36 = ☐

4. 221 ÷ 17 = ☐

Are your answers reasonable?

Turn over the paper and work some of the problems first graders made up for themselves after working the above problems.

Problems First Graders Gave Themselves

182796 + 35240 =
(give the verbal name for your answers)

1000 x 1000 =

4326 x 7825 =

1265418 x 872563 =

459 ÷ 63 =
(talk about rounding)

Concepts

Can you make the calculator count backwards from 10? (Hint: 10,-,1,=,=,=,...) Write the numbers you get in the blanks below

10
9

Do you see a pattern?

What does it remind you of? (A Thermometer?)

If you start at six and go down ten, where do you stop?

Solve

6-10 = ☐

Try

9-14 = ☐

Describe on the thermometer.

Applications

1. If each of the 424 kids in this school brought 6 cookies to school, how many cookies would we have altogether?

   How much money would the school make if you sold each cookie for five cents?

   (How does your answer differ from the usual dollars and cents notation?)

   _____

   _____

2. A bicycle wheel usually has about 32 spokes. If there are 123 bikes at the school bike rack, how many spokes are there?

3. How many seconds are there in a year?

   How long would it take to count to this number by one's?

Applications

4. A small bag of M & M's usually contains 23 candies. Your class has 12 girls and 14 boys. If you had 9 bags of M & M's, how many candies would each person get (include the teacher)?

If you don't break any individual candies, how many will be left over?

5. Suppose you stacked up 424 math books in a single stack on the playground. How high would the stack be?

Problem Solving

Problem Solving activities are designed to require students to tackle an original problem and draw together a variety of mathematical concepts in new and interesting ways. Such activities often generate several interesting side issues which teach mathematics and give children experience directing their own thinking. The following illustrates some of the experiences involved in problem solving.

Find $\square$ so that

$$\square \times \square = 437$$

First try:

$$53 \times 53 = \square$$

but

$$\square > 437$$

So 53 is too big

Problem Solving

Try:

20x20 = ☐

and ☐ < 437

Thus, 20 is too small

Try:

23x23 = ☐

☐ > 437

Thus, 23 is too ------

Try:

21x21 = ☐ ○ 437

Now, since

20x20 = 400 < 437

and

21x21 = 441 > 437

Problem Solving

Try:

20.5x20.5 = $\boxed{}$

Try:

20.7x20.7 = $\boxed{}$

Try:

20.9x20.9 = $\boxed{}$

Try:

20.91x20.91 = $\boxed{}$

Can you get any closer?

Try:

20.905x20.905 = 437.01902

But shouldn't the number end in 5?

Multiply by hand to check.

Problem Solving

```
     20.905
    x20.905
    104525
  1881450
 418100
 437.019025
```

Did the calculator round off
or drop the 5 ?

Check by:
20.906x20.906 = [ ]

Should end in 6. Did it round off
or drop the last digit?

_____

Try:
20.9049x20.9049 = 437.01484

Try:
20.9048x20.9048 = 437.01066

Try:
20.9046,x, = [ ]

How many digits in the answer? Why?

____ _____

Problem Solving

Check by multiplying by hand:

```
 20.9046
x20.9046
--------
```

(Check 437.00230116)

Reason for only seven digits is that eighth digit is a zero.

Now continuing:

20.9045,x, = [ ]

20.90455,x, = [ ]

20.90453,x, = [ ]

20.90454,x, = [ ]

20.904545,x, = [ ]

Check by hand:

```
      20.904545
     x20.904545
     ----------
     104522725
     83618180
   104522725
   83618180
 1881409050
418090900
----------------
437.000001667025
```

Thus we have a good approximation for the solution, but still not exactly the solution. It is mathematically impossible to ever get exactly the right answer to this problem regardless of how long we work.

The following pages are taken from elementary school mathematics textbooks. The comments at the bottom of each page are designed to illustrate some of the ways a calculator might be used with existing textbook pupil pages.

EXERCISES

Find the average.

1. 3, 7, 2 **2.** 2, 6, 5, 3 **3.** 4, 8

4. 6, 2, 7 **5.** 4, 2, 7, 2, 5 **6.** 14, 12, 16

7. 40, 50, 45 **8.** 10, 0, 8, 2 **9.** 35, 42, 58

10. 90, 90, 90, 90 **11.** 20, 30, 40, 50, 60

12. 1, 2, 8, 5, 9, 7, 3 **13.** 43, 65, 28, 53, 26

14. 34, 35, 38, 36, 37, 30 **15.** 5, 8, 10, 15, 19, 9

Solve these problems.

16. John's scores on his spelling tests were 60, 80, 70, 100, 90. What was his average score?

17. The temperature was measured for a week at 1 o'clock. The following temperatures were recorded:
Sun. 40°, Mon. 42°, Tues. 50°, Wed. 49°, Thurs. 35°, Fri. 45°, Sat. 54°.
What was the average temperature for the week?

HEALTH CHART

	Weight	*Height*
Bob	124 pounds	62 inches
Paul	132 pounds	65 inches
John	110 pounds	59 inches

18. What is the average weight of the three boys?

19. What is the average height of the three boys?

Calculator Use

The basic concept being taught is the concept of average.
Do the exercises with a calculator. Have students write out the steps.
Supplement the problems with ones involving your own students. For example, what is the average age of our class (list on the board)? What is the average number of minutes our class spends traveling to school?
Have students determine if answers are reasonable.

Nichols, et. al. Holt School Mathematics (1974) Grade 4, p. 215.

1. 2 tens + 4 ones 20 + 4 24	2. 5 tens + 3 ones ___ + ___ ___
3. 7 tens + 6 ones ___ + ___ ___	4. 4 tens + 0 ones ___ + ___ ___
5. 8 tens + 5 ones ___ + ___ ___	6. 9 tens + 9 ones ___ + ___ ___

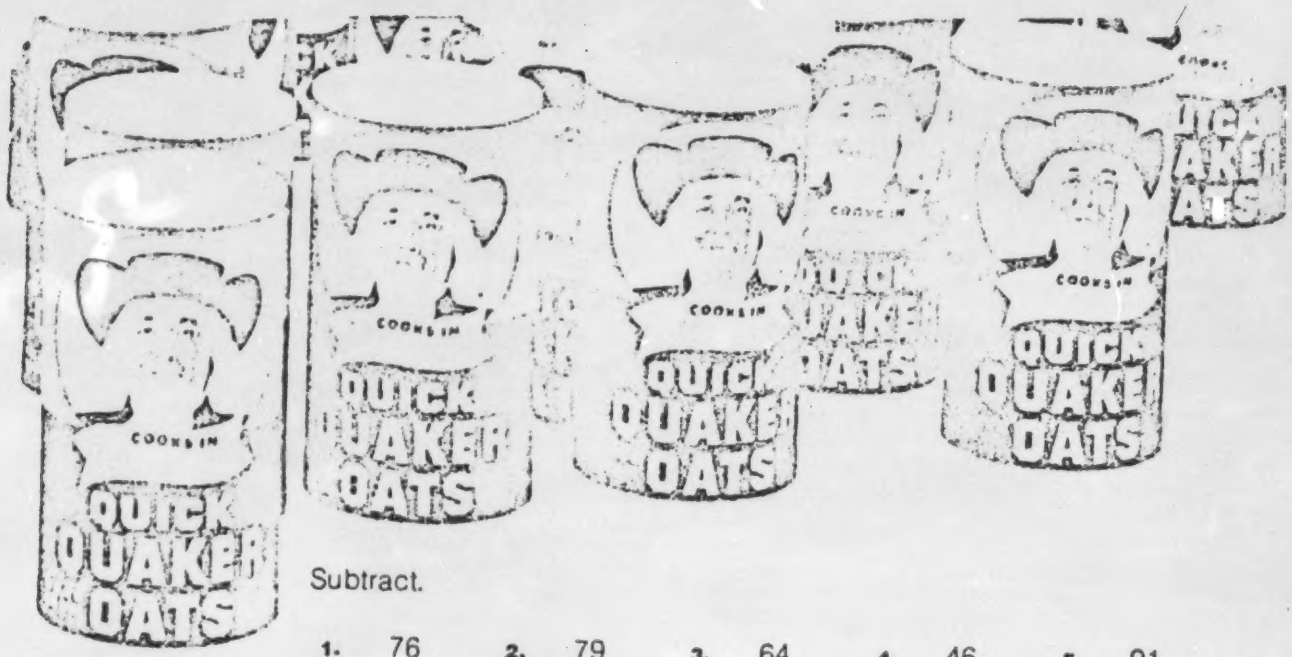
Calculator Use

Do the problems without the calculator and then do them with the calculator.

Further activities could include "What do you subtract from 24 to blank out the ten's digit?" (24-20=4). Or, "What do you subtract from 48 to make the unit's digit zero?" (48-8=40).

Nichols, et. al., Holt School Mathematics (1974) Grade 2, p. 57.

Use of the Calculator
with Text Pages



Subtract.

1. 76 − 59	2. 79 − 21	3. 64 − 17	4. 46 − 23	5. 91 − 37
6. 87 − 15	7. 88 − 54	8. 62 − 20	9. 67 − 16	10. 94 − 86
11. 47 − 9	12. 94 − 65	13. 96 − 81	14. 26 − 5	15. 91 − 65
16. 81 − 43	17. 20 − 9	18. 84 − 27	19. 56 − 28	20. 92 − 78
21. 93 − 47	22. 68 − 29	23. 72 − 35	24. 81 − 66	25. 64 − 39

Calculator Use

2 lines by hand. Have neighbor check on calculator. If you miss more than one, do the next ten, check your own with calculator. If you miss more than one of the second ten, do the last five and check with calculator.

Scott, Foresman, Mathematics Around Us (1975) Grade 3 p. 109.

7 2 5 4

7000 200 50 4

e number 7254 in expanded form is
00 + 200 + 50 + 4.

ve the expanded form.

8264 _____

9321 _____

629 _____

745 _____

593 _____

6837 _____

801 _____

5426 _____

9090 _____

1700 _____

ve the number.

600 + 30 + 5 _____

4000 + 200 + 80 _____

6000 + 700 + 40 + 8 _____

1000 + 300 + 1 _____

900 + 50 _____

700 + 70 + 7 _____

100 + 70 + 9 _____

5000 + 600 + 30 + 2 _____

2000 + 60 _____

8000 + 400 + 6 _____

Find each answer.

1. 3 × 5 _____
2. 2 × 7 _____
3. 5 × 6 _____
4. 9 × 1 _____
5. 0 × 8 _____
6. 6 × 6 _____
7. 5 × 7 _____
8. 9 × 3 _____
9. 4 × 8 _____
10. 3 × 9 _____
11. 4 × 9 _____
12. 8 × 3 _____
13. 4 × 6 _____
14. 3 × 8 _____
15. 5 × 5 _____
16. 6 × 5 _____
17. 9 × 2 _____
18. 7 × 0 _____
19. 9 × 4 _____
20. 4 × 7 _____
21. 8 × 4 _____
22. 7 × 5 _____
23. 7 × 4 _____
24. 3 × 6 _____
25. 10 ÷ 5 _____
26. 6 ÷ 1 _____
27. 16 ÷ 4 _____
28. 18 ÷ 2 _____
29. 24 ÷ 3 _____
30. 18 ÷ 3 _____
31. 36 ÷ 6 _____
32. 25 ÷ 5 _____
33. 35 ÷ 7 _____
34. 27 ÷ 9 _____
35. 32 ÷ 8 _____
36. 24 ÷ 8 _____
37. 28 ÷ 7 _____
38. 30 ÷ 5 _____
39. 30 ÷ 6 _____
40. 27 ÷ 3 _____
41. 36 ÷ 9 _____
42. 35 ÷ 5 _____
43. 9 ÷ 9 _____
44. 24 ÷ 4 _____
45. 28 ÷ 4 _____
46. 32 ÷ 4 _____
47. 21 ÷ 3 _____
48. 36 ÷ 4 _____

Calculator Use

Drill and practice in pairs with calculator.

23

Scott, Foresman, Mathematics Around Us (1975) Grade 3 p. 199.

5. Solve the equations.

[A] $5+(8+7)=n$
[B] $(5+8)+7=n$
[C] $(9+7)+8=x$
[D] $9+(7+8)=x$
[E] $(9+8)+7=q$
[F] $5+(3\times4)=r$
[G] $(5+3)\times4=s$
[H] $(5+4)\times3=a$
[I] $3\times(5+2)=t$
[J] $(3\times5)+2=y$
[K] $(3\times4)+(5\times4)=q$
[L] $8\times4=s$
[M] $(5\times6)+(4\times6)=n$
[N] $9\times6=t$
[O] $5\times0=a+0$

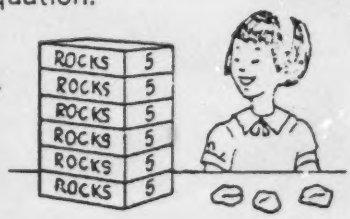
6. Solve the equations.

[A] $(4\times6)+7=n$
[B] $(3\times7)+8=y$
[C] $(8\times3)+9=a$
[D] $(6\times3)+6=c$
[E] $(9\times3)+6=d$
[F] $(8\times2)+8=s$
[G] $(7\times6)+9=t$
[H] $(5\times6)+5=n$
[I] $(6\times2)+q=20$
[J] $(3\times8)+t=30$
[K] $(4\times7)+r=34$
[L] $(3\times9)+n=35$
[M] $(6\times7)+b=42$
[N] $(8\times9)+a=81$
[O] $(9\times6)+x=60$
[P] $(7\times7)+y=55$
[Q] $(n\times4)+3=23$
[R] $(y\times6)+5=41$
[S] $(r\times9)+5=50$
[T] $(t\times8)+3=51$
[U] $(n\times7)+6=62$
[V] $(b\times6)+5=59$
[W] $(c\times7)+8=64$
[X] $(d\times6)+5=47$

7. Write an equation for each problem. Solve the equation.

[A] In her rock collection, Sue had 6 boxes with 5 rocks in each box. She found 3 more rocks. How many rocks did she have in all?

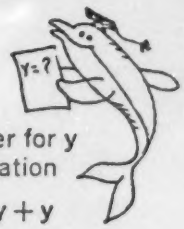
[B] Ned shot 6 arrows, gave Fred a turn, and then shot 3 more arrows. Ned did this 7 times. How many arrows did he shoot?



8. The same letter is used more than once in the equations below. As in exercise A, give the number that will make the equation true.

[A] $n+n=16$
$n=8$
[B] $a\times a=16$
[C] $y+y=18$
[D] $y\times y=81$
[E] $t+t=64$
[F] $5+n+n=9$
[G] $x+x+7=15$
[H] $r\times r\times r=27$
[I] $s+s+s=12$

Think



Give a number for y so that the equation

$y\times y=y+y$

will be true.
Find another such number.

Calculator Use

Basically use as is with calculators.
Note: order of operations
solving equations
Encourage some beefing of numbers
For example:

a x a = 256
q x q = 1369
p x p x p = 343

Suggest a competition on "Think" problem between one student with calculator and one without.

Addison-Wesley (1968) Grade 5 p.25.

Quotients between 100 and 1000

To find the quotient for $4\overline{)1428}$, we find the greatest number of fours that can be subtracted from 1428. Since 100×4 is less than 1428 and 1000×4 is greater than 1428, we look for the quotient between 100 and 1000. Since $\begin{matrix} 300 \times 4 < 1428 \\ 400 \times 4 > 1428 \end{matrix}$, we find the quotient as shown in example A.

(A)

Think:

```
   357 ←
4)1428
  1200 ← 300×4
   228
   200 ← 50×4
    28
    28 ← 7×4
     0
```

We can subtract 300 fours from 1428.

Then we can subtract 50 more fours.

Finally, we can subtract 7 more fours.

Write:

```
   357
4)1428
  1200   (300)
   228
   200   (50)
    28
    28   (7)
     0
```

Give the missing numbers and the quotients for examples B and C.

(B)

```
6)1842 ←
  1800 ←   ×6
    42
    42 ←   ×6
     0
```

(C)

```
8)3204 ←
  3200 ←   ×8
     4
```

EXERCISES

Copy each exercise and find the quotient and remainder.

1. $2\overline{)1534}$	2. $5\overline{)3641}$	3. $8\overline{)5030}$	4. $4\overline{)3008}$
5. $3\overline{)1527}$	6. $7\overline{)2804}$	7. $6\overline{)5316}$	8. $9\overline{)7134}$
9. $6\overline{)3504}$	10. $7\overline{)2835}$	11. $8\overline{)3986}$	12. $9\overline{)5050}$
13. $4\overline{)2008}$	14. $9\overline{)8003}$	15. $6\overline{)5994}$	16. $8\overline{)5930}$

Calculator Use

Do problems 1,6,11,16 using paper and pencil.

Do problems 4,7,10,13 with the calculator.

Check problem 4 using paper and pencil.

Check problem 16 using the calculator.

(Note: Get kids reaction to check on problem 16 for next day and consult hints on division)

Addison-Wesley (1968) Grade 5 p. 125.

Chapter review

1. Give the multiple of 10 that is closest to each number.

   [A] 12 [B] 39 [C] 41 [D] 67 [E] 134 [F] 866 [G] 1068

2. Give the multiple of 100 that is closest to each number.

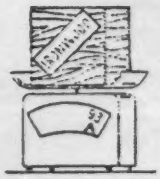
   [A] 509 [B] 197 [C] 86 [D] 1367 [E] 6945 [F] 5999

3. Write an equation that shows how to estimate the answer for each exercise. Use multiples of 10.

   [A] $39 + 78$ [D] 27×52 [G] 14×98 [J] $801 - 98$
   [B] $397 + 88$ [E] $423 \div 58$ [H] 65×35 [K] 48×54
   [C] $503 - 59$ [F] 85×46 [I] $719 \div 83$ [L] $561 \div 72$

4. Write an equation that shows how to estimate the answer for each exercise. Use multiples of 100.

   [A] $513 + 978$ [C] 92×112 [E] $6729 - 3687$
   [B] $1503 - 498$ [D] $3543 \div 726$ [F] $4864 \div 697$



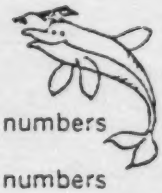
5. Ironwood is one of the heaviest types of wood. It weighs 93 pounds per cubic foot. Balsa is one of the lightest types of wood. It weighs about 8 pounds per cubic foot. A cubic yard is 27 cubic feet.

   [A] Estimate the weight of a cubic yard of ironwood.
   [B] Estimate the weight of a cubic yard of balsa wood.

6. Some large autos are 19 feet long. One of the largest buses ever built was 57 feet long. Estimate the number of cars that could fit into a space long enough for the bus.

★ 7. One of the longest bicycles ever built was a 10-seater built in 1898. It was 23 feet 9 inches long. Estimate the difference between the length of this bicycle and the total length of 10 ordinary bicycles, each 5 feet 9 inches long.

Think



How many 1-digit numbers are there?
How many 2-digit numbers are there?
Estimate the number of 3-digit numbers.

Calculator Use

3-7 Students make and record estimates. Work problems with calculator and find difference between estimate and calculator answer.

Addison-Wesley (1968) Grade 5 p.75.

New Concepts

Negative Integers

Decimals

Large Numbers

Multiplication

Division

Estimation

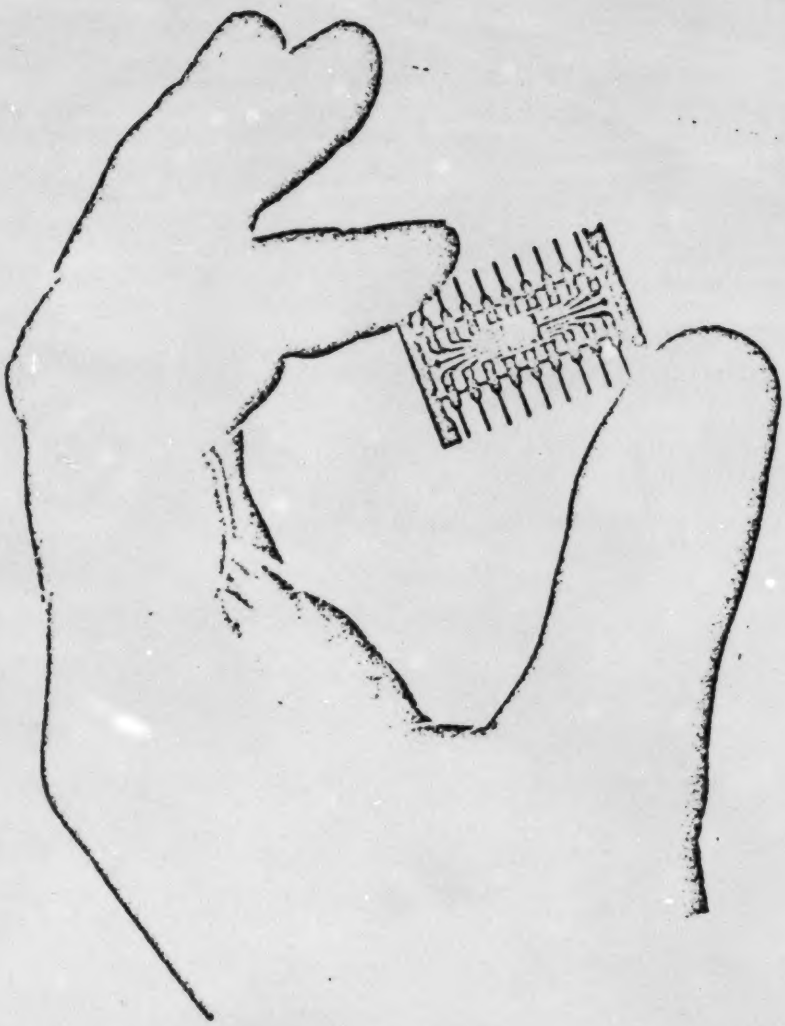
Rounding

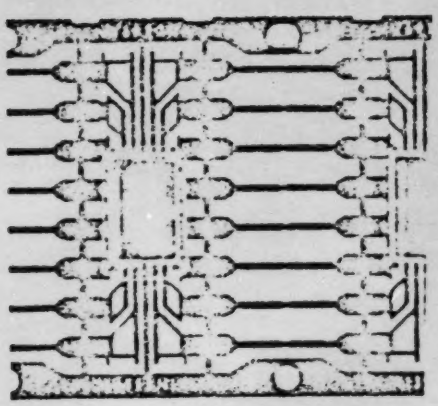
Loading batteries

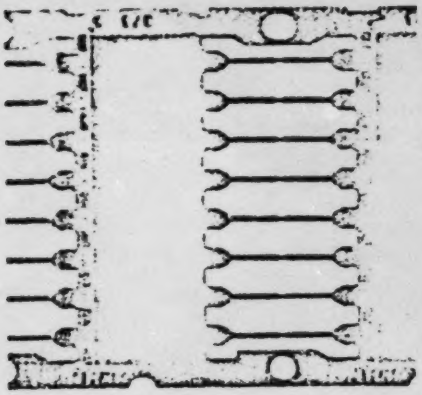
What's inside

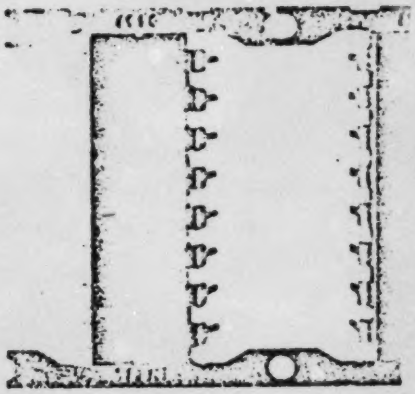
How to store in the classroom

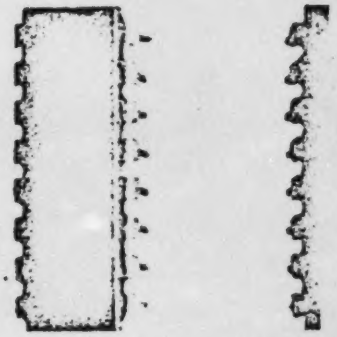
First day activities

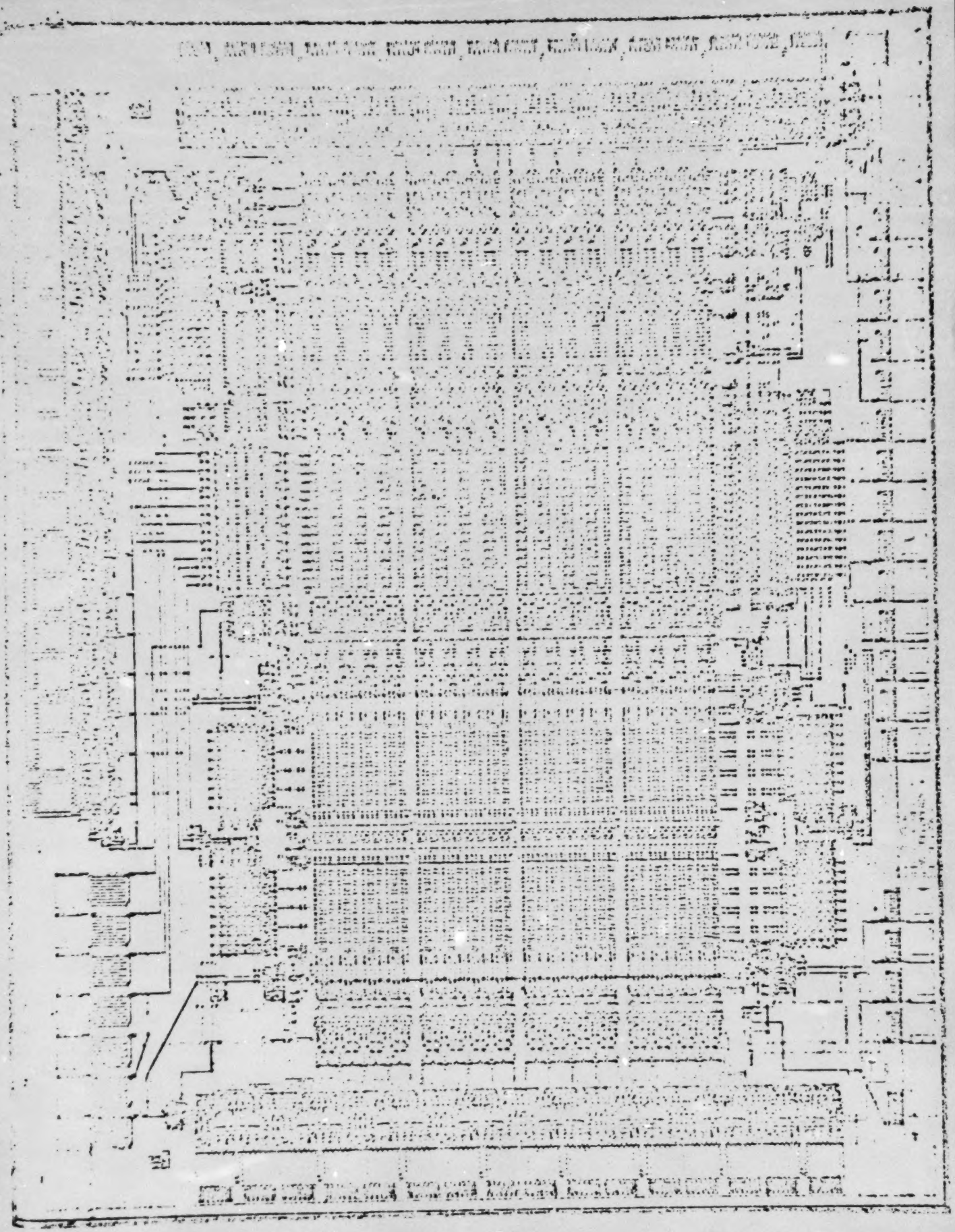












Date:_____ Name:_____

Example: For each pair of words below place an X on the blank that best tells how you feel about--

SNOW

like ___:_X_:___:___:___ hate

cold _X_:___:___:___:___ hot

work ___:___:_X_:___:___ play

These responses would indicate that the person likes snow but is not crazy about it. The person thinks snow is very cold and that snow means some work and some play.

Directions: For each pair of words below place an X on the blank that best tells how you feel about--

MATH

beneficial ___:___:___:___:___ harmful

passive ___:___:___:___:___ active

understandable ___:___:___:___:___ mysterious

frill ___:___:___:___:___ necessary

deep ___:___:___:___:___ shallow

bad ___:___:___:___:___ good

changing ___:___:___:___:___ constant

tool ___:___:___:___:___ toy

strange ___:___:___:___:___ familiar

weak ___:___:___:___:___ strong

simple ___:___:___:___:___ complicated

confining ___:___:___:___:___ expanding

sad ___:___:___:___:___ happy

brave ___:___:___:___:___ scared

slow ___:___:___:___:___ fast

crutch ___:___:___:___:___ tool

boring ___:___:___:___:___ exciting

jump in ___:___:___:___:___ hold back

hard ___:___:___:___:___ easy

more ___:___:___:___:___ less

Date: _____ Name: _____

Example: For each pair of words below place an X on the blank that best tells how you feel about—

SNOW

like ___:_X_:___:___:___ hate

cold _X_:___:___:___:___ hot

work ___:___:_X_:___:___ play

These responses would indicate that the person likes snow but is not crazy about it. The person thinks snow is very cold and that snow means some work and some play.

Directions: For each pair of words below place an X on the blank that best tells how you feel about—

CALCULATORS

beneficial ___:___:___:___:___ harmful

passive ___:___:___:___:___ active

understandable ___:___:___:___:___ mysterious

frill ___:___:___:___:___ necessary

deep ___:___:___:___:___ shallow

bad ___:___:___:___:___ good

changing ___:___:___:___:___ constant

tool ___:___:___:___:___ toy

strange ___:___:___:___:___ familiar

weak ___:___:___:___:___ strong

simple ___:___:___:___:___ complicated

confining ___:___:___:___:___ expanding

sad ___:___:___:___:___ happy

brave ___:___:___:___:___ scared

slow ___:___:___:___:___ fast

crutch ___:___:___:___:___ tool

boring ___:___:___:___:___ exciting

jump in ___:___:___:___:___ hold back

hard ___:___:___:___:___ easy

more ___:___:___:___:___ less

PACKET

PART II

COUNTING ON THE CALCULATOR

Teach Your Calculator to Count

Make your calculator count like this:

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, ...

10, 20, 30, 40, 50, 60, 70, 80, ...

3, 6, 9, 12, 15, 18, 21, 24, ...

990, 991, 992, 993, 994, 995, ...

Finish this sequence.

3 ⊞ 3 ⊟ ⊞ 3 ⊟ ⊞ 3 ⊟ ⊞ 3 ⊟ + ...

3, 6, 9, ____, ____, ...

Complete these sequences.

⊞ 2 ⊟ ⊞ 2 ⊟ ⊞ 2 ⊟ ⊞ 2 ⊟ + ...

____, ____, ____, ____, ____, ...

12 ⊞ 5 ⊟ ⊟ ⊟ ⊟ ...

____, ____, ____, ____, ____, ...

127 ⊞ 1 ⊟ ⊟ ⊟ ⊟ ...

____, ____, ____, ____, ____, ...

5 ⊞ 1 ⊟ ⊞ 1 ⊟ ⊞ 1 ⊟ ⊞ 1 ⊟ + ...

____, ____, ____, ____, ____, ...

16 ⊞ 10 ⊟ ⊟ ⊟ ⊟ ...

____, ____, ____, ____, ____, ...

5 ⊞ ⊟ ⊟ ⊟ ⊟ ...

____, ____, ____, ____, ____, ...

Experiment yourself: Find out how long it takes you to count by ones to 100 on the calculator. Use your information to answer these questions.

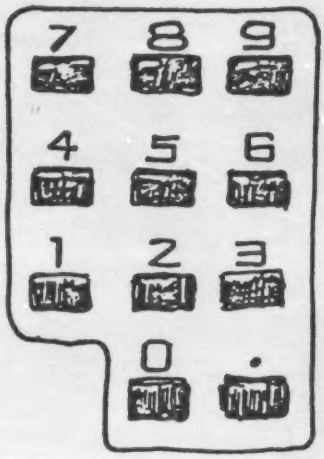
How long will it take to count to:

A. 200 by twos?
B. 1000 by ones?
C. 100 by twos?
D 1000 by tens?
E. 10 by tenths (0.1)?

NUMERATION GAME

Target:

1. Each player needs a copy of this sheet.
2. Each player chooses 3 digits (number keys on the calculator).
3. Players then arrange their 3 digits in the □'s so that the sum is close to the target number.
4. The player coming closest to the target wins the game.



Game 1

□□□
+□□□
5 2 3 ← TARGET NUMBER

Game 2

□□□
+□□□
7 5 1

Game 3

□□□
+□□□
4 4 7

Game 4

□□□
+□□□
1 2 3 4

Game 5

□□□
+□□□
6 9 6

Game 6

□□□
+□□□
7 4 3

Game 7

□□□
+□□□
1 5 6 3

Game 8

□□□
+□□□
1 7 8 6

Game 9

□□□
+□□□
8 7 5

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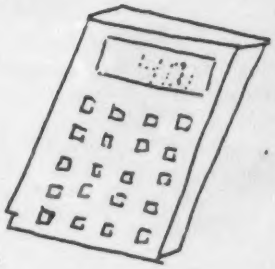
WIPE OUT

JOHN
PRESSED
431

MARY "WIPED OUT"
THE 3



TELL WHICH KEYS MARY PRESSED

- , 3   + , 0   - , 30   ?

TRY SOME

ENTER	WIPE OUT	KEYS PRESSED	WRITE THE ANSWER
672	7	_____	_____
384	8	_____	_____
3761	6	_____	_____
9761	7	_____	_____
4332	BOTH 3's	_____	_____

NUMBER LUMBER I

Use your calculator to find the total of each log.

Four hundred ninety-seven plus three hundred six equals _____

Three thousand two hundred plus five thousand ninety-five plus twelve thousand five hundred equals _____

Thirty-five thousand plus fifty thousand four hundred plus twenty-three thousand three hundred seven plus nineteen thousand equals _____

One hundred twenty-five thousand plus thirty-four thousand plus twenty-five hundred plus two hundred thousand equals _____

Eight hundred sixty-six plus seven hundred thirty four plus twenty-one thousand seven hundred plus one thousand two hundred six plus one hundred one equals _____

OVERFLOW

PRESS THE 2 KEY 10 TIMES.

HOW MANY 2's DO YOU SEE? _____

TRY THIS

ENTER $\underbrace{11111111}_{\text{8 ONES}}$ +, =, =, =, =, =, =, =, =, =

WHAT NUMBER IS DISPLAYED? _____

HOW MANY DIGITS DOES IT HAVE? _____

ADD 99999999 + 1 = WHAT HAPPENS?

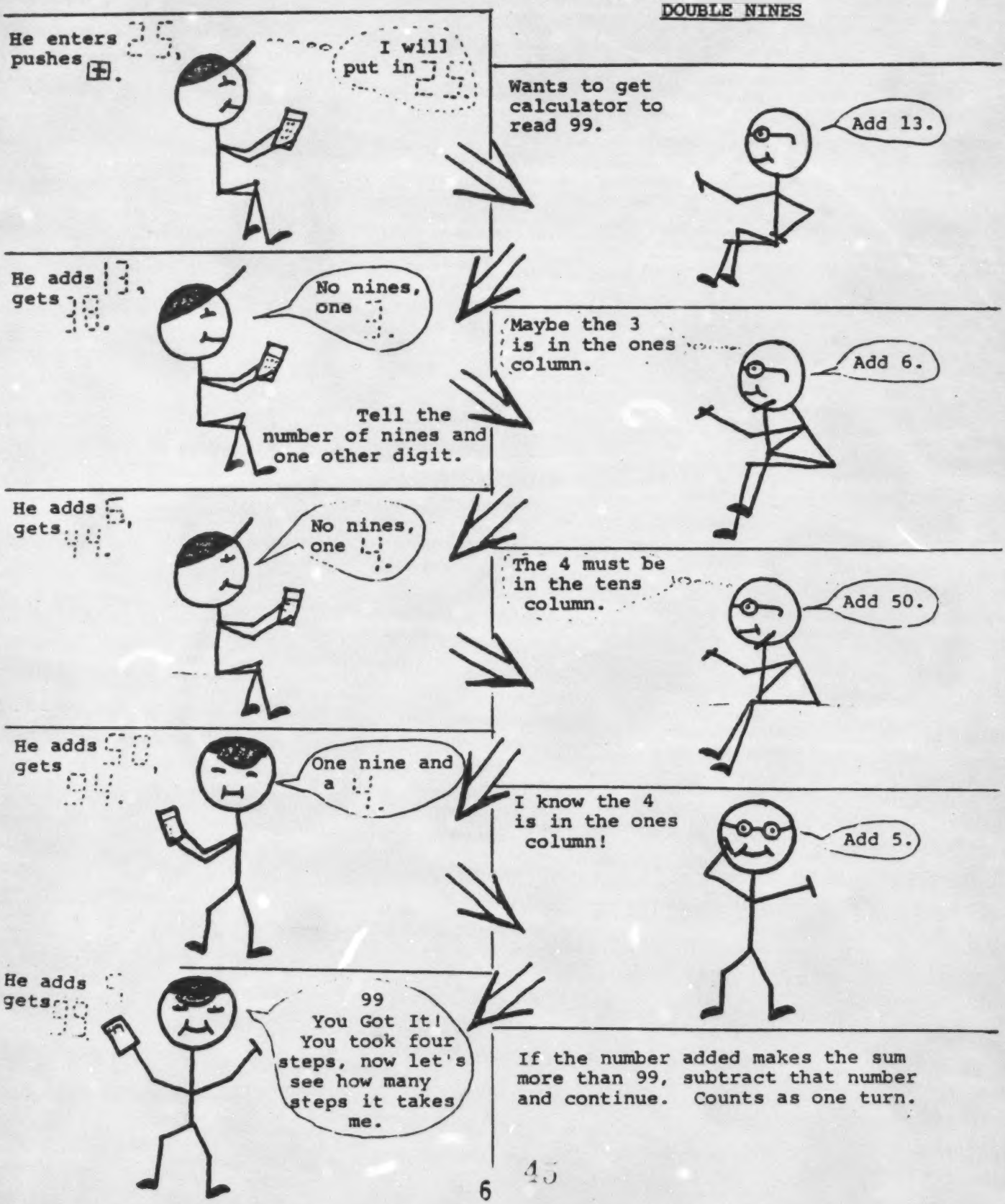
WHAT IS THE LARGEST

NUMBER YOUR CALCULATOR

CAN DISPLAY? _____

Purpose: Get the calculator to show 99 by adding numbers. Fewest trials win!

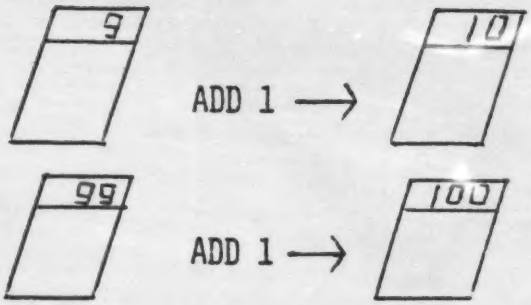
DOUBLE NINES



If the number added makes the sum more than 99, subtract that number and continue. Counts as one turn.

PLACE VALUE

WITH YOUR CALCULATOR



WRITE THE LARGEST THREE
DIGIT NUMBER YOU CAN SHOW _____ ADD 1 ⟶ _____

WRITE THE LARGEST FOUR
DIGIT NUMBER YOU CAN SHOW _____ ADD 1 ⟶ _____

WRITE THE LARGEST FIVE
DIGIT NUMBER YOU CAN SHOW _____ ADD 1 ⟶ _____

WRITE THE LARGEST SIX
DIGIT NUMBER YOU CAN SHOW _____ ADD 1 ⟶ _____

WRITE THE LARGEST SEVEN
DIGIT NUMBER YOU CAN SHOW _____ ADD 1 ⟶ _____

WITHOUT YOUR CALCULATOR

WHAT IS THE LARGEST EIGHT
DIGIT NUMBER YOU COULD SHOW? _____ ADD 1 ⟶ _____

ORDERING

CHOOSE THE SMALLEST NUMBER FROM EACH BOX, ENTER IT AND PUSH +. CHECK YOUR FINAL ANSWER WITH THE CHECK NUMBER.

152	23	523	321
201	56	235	231
129	147	352	213
199	29	532	312

CHECK NUMBER ⇒ 600

CHOOSE THE LARGEST NUMBER FROM EACH BOX, ENTER IT AND PUSH +. CHECK YOUR FINAL ANSWER WITH THE CHECK NUMBER.

1	153	801	0
2	531	810	111
14	315	777	134
7	222	569	99

CHECK NUMBER ⇒ 1489

CHOOSE THE LARGEST EVEN NUMBER FROM EACH BOX, ENTER IT AND PUSH +. CHECK YOUR FINAL ANSWER WITH THE CHECK NUMBER.

8	34	48	120
9	16	27	1007
21	89	14	98

CHECK NUMBER ⇒ 210

3 SETS OF 5

COUNT
BY 5'S 5, +, =, =, = _____

TRY THIS: PRESS 3, x, 5, = _____ (3 TIMES 5)

IS THE ANSWER ALSO 15?

TRY BOTH WAYS

	COUNT	USE x
4 SETS OF 2	2 + = = = =	4 x 2 = ____
3 SETS OF 4		
5 SETS OF 3		
4 SETS OF 4		

G. Immerzeel

Experiences With the Hand-held Calculator in Teaching Computation

Find an easy way to find the sum of these numbers.

①	②	③	④
35	128	356	1245
35	128	356	1245
35	128	356	1245
35	128	356	1245
35	128	356	1245
35	128	356	1245
35	128	356	1245

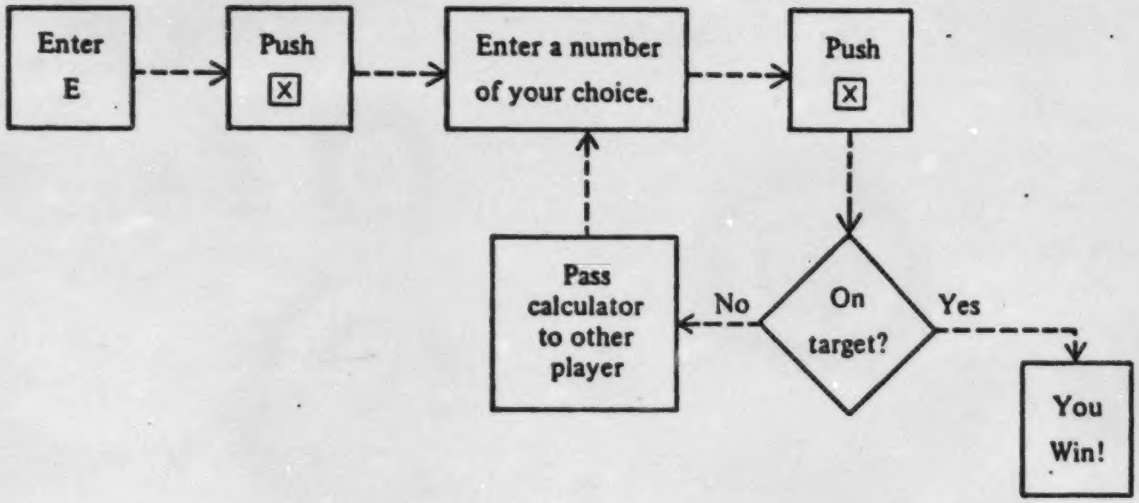
⑤	⑥	⑦	⑧
1795	4250	9278	15125
1795	4250	9278	15125
1795	4250	9278	15125
1795	4250	9278	15125

⑨	⑩	⑪	⑫
493-	5791	1234	8950
493	5791	1234	8950
493	5791	1234	8950
493	5791	1234	8950
493	5791	1234	8950
493	5791	1234	8950
493	5791	1234	8950
493	5791	1234	8950
493	5791	1234	8950
493	5791	1234	8950

ESTIMATING MULTIPLICATION

Target: Multiplication

Using only the ⊠ and numbers, try to "hit the target."



Try these games.

GAME 1
E = 25
Target Area
680 — 710

GAME 2
E = 12
Target Area
370 — 400

GAME 3
E = 15
Target Area
490 — 510

GAME 4
E = 21
Target Area
810 — 830

GAME 5
E = 49
Target Area
1,500 — 1,600

GAME 6
E = 95
Target Area
2,500 — 2,550

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COMPUTING POWER

USE A CALCULATOR TO SOLVE THESE EXAMPLES.

31 X 7 = _____ 25 X 9 = _____

76 X 8 = _____ 82 X 5 = _____

NOW TRY TO SOLVE THESE WITHOUT A CALCULATOR. USE THE RESULTS FROM ABOVE. CHECK WITH A CALCULATOR IF NECESSARY.

310 X 7 = _____ 25 X 900 = _____

31 X 70 = _____ 2500 X 9 = _____

760 X 80 = _____ 82 X 50 = _____

76000 X 8 = _____ 820 X 500 = _____

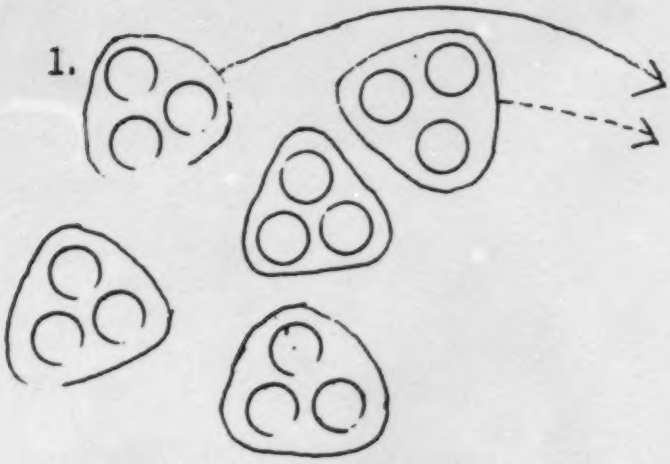
THESE EXAMPLES MAY BE TOO BIG FOR A CALCULATOR. CAN YOU DO THEM ANYWAY?

31000 X 700 = _____ 25000000 X 80 = _____

76000 X 8000000 = _____ 82000 X 5000 = _____

DIVISION - REPEATED SUBTRACTION

1.



COUNT OUT 15 CHIPS. TAKE 3 OF THEM AWAY. THEN TAKE THREE MORE AWAY, THEN 3 MORE, UNTIL THEY ARE ALL GONE.

HOW MANY GROUPS OF 3 DID YOU TAKE AWAY? _____

2.

ON YOUR CALCULATOR SUBTRACT 3 FROM 15 UNTIL YOU GET TO 0.

PRESS 15, -, 3, =, =, =, =, =

HOW MANY 3's DID YOU SUBTRACT? _____

3.

ON YOUR CALCULATOR DIVIDE 15 BY 3.

15 ÷ 3 = _____

ARE THE ANSWERS THE SAME IN 1, 2, AND 3?

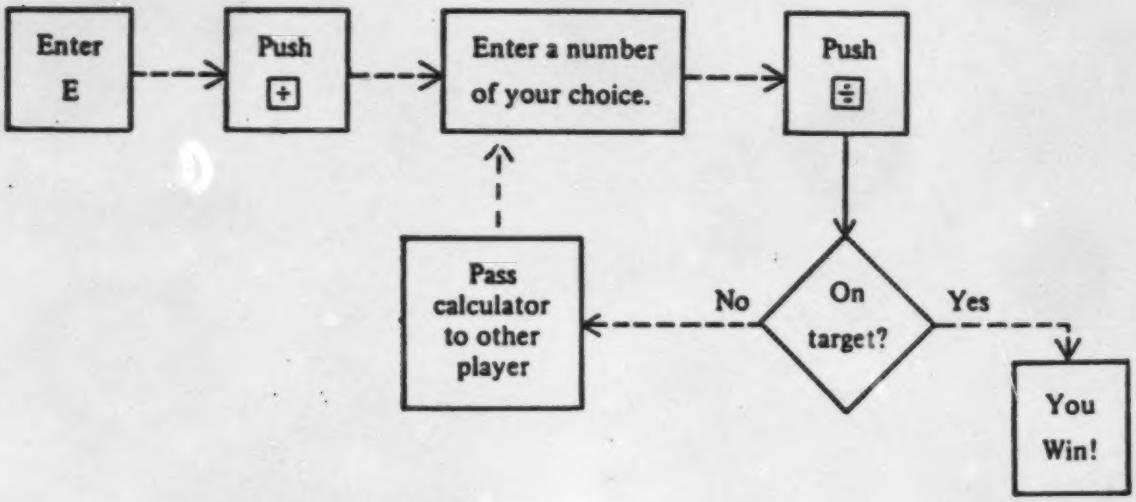
4.

COMPLETE THE FIRST THREE STEPS USING 24 CHIPS AND TAKING AWAY GROUPS OF 6.

ESTIMATING DIVISION

Target: Division

Using the ⊞ and numbers, try to "hit the target."



Try these games.

GAME 1
E = 1,250
Target Area
25 — 30

GAME 2
E = 999
Target Area
20 — 23

GAME 3
E = 6,245
Target Area
30 — 35

GAME 4
E = 1,862
Target Area
16 — 17

GAME 5
E = 2,500
Target Area
15 — 120

GAME 6
E = 1,000,000
Target Area
990 — 1,010

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SUBTRACT 11 FROM 88 UNTIL YOU GET 0 ON THE DISPLAY.
TO DO THIS PRESS 88 - 11 FOLLOWED BY AS MANY =s AS YOU NEED.

HOW MANY 11s CAN YOU SUBTRACT FROM 88? _____

NEXT DIVIDE 88 BY 11 WITH YOUR CALCULATOR.

88 ÷ 11 = _____

DID YOU GET THE SAME ANSWER FOR EACH? _____

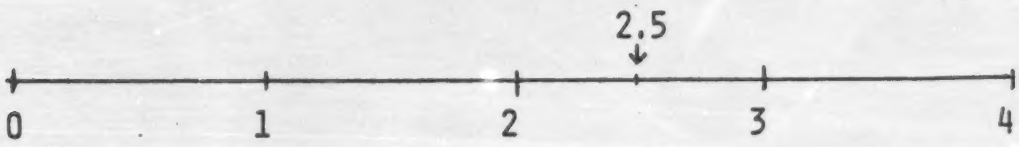
HOW MANY TIMES CAN YOU SUBTRACT:

42 FROM 126? _____	126 ÷ 42 = _____
24 FROM 456? _____	456 ÷ 24 = _____
87 FROM 1044? _____	1044 ÷ 87 = _____
123 FROM 984? _____	984 ÷ 123 = _____
94 FROM 1598? _____	1598 ÷ 94 = _____
27 FROM 122? _____	122 ÷ 27 = _____

DECIMALS

LOOK AT THE DECIMAL POINT 2.5

2.5 IS A NUMBER BETWEEN 2 AND 3



THERE ARE OTHER NUMBERS BETWEEN 2 AND 3. THEY ALL START WITH 2.

NAME SOME: 2.____ 2.____ 2.____ 2.____

ADD 2.5 + 2.7 = _____

2.1 + 2.1 = _____

2.3 + 2.8 = _____

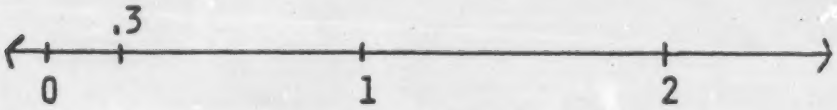
2.6 + 2.6 = _____

2.2 + 2.3 = _____

TELL WHY EACH SUM IS LESS THAN 6.

DECIMALS

.3 IS BETWEEN 0 AND 1



COUNT BY .3

.3, +, =, =, . . . STOP WHEN YOU GO PAST 1.0

COUNT BY .2

.2, +, =, =, . . . STOP WHEN YOU <u>REACH</u> 1.0

SHOW WHERE .2 WOULD BE ON THE NUMBER LINE.

COUNT AND KEEP TRACK

COUNT BY ...	WRITE EACH NUMBER
.2	.2 .4 ___ ___ ___
.3	___ ___ ___ ___
.4	___ ___ ___ ___
.5	___ ___ ___ ___
.1	___ ___ ___ ___ ___ ___ ___ ___ ___ ___
.6	___ ___

DECIMALS AND FRACTIONS

FIND TWO NUMBERS SO THAT

____ ÷ ____ = .5

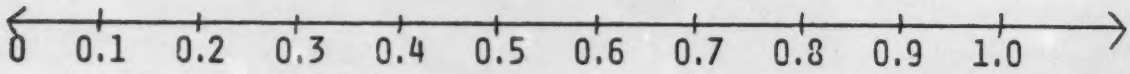
1 ÷ 2 WORKS

TRY SOME

KEEP TRACK

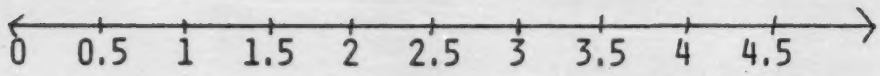
1	÷	2	=	.5
7	÷	14	=	
3	÷		=	.5
4	÷		=	.5
8	÷		=	.5
	÷	4	=	.5
	÷	10	=	.5

DECIMAL NUMBER LINE



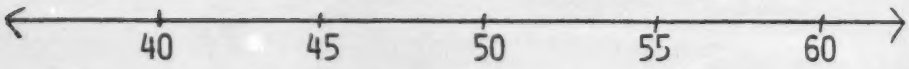
USE A CALCULATOR TO LOCATE THESE FRACTIONS ON THE ABOVE NUMBER LINE.

$\frac{1}{2}$ $\frac{3}{5}$ $\frac{3}{8}$ $\frac{4}{7}$ $\frac{5}{12}$



LOCATE THESE FRACTIONS ON THE SECOND NUMBER LINE.

$\frac{3}{2}$ $\frac{21}{7}$ $\frac{28}{8}$ $\frac{13}{6}$ $\frac{12}{5}$



LOCATE THESE FRACTIONS ON THE THIRD NUMBER LINE.

$\frac{120}{3}$ $\frac{88}{2}$ $\frac{236}{4}$ $\frac{236}{5}$ $\frac{4290}{82}$

Order of Operations

The use of parentheses and the order of operations (multiply, divide, add, subtract—in that order) become important when you use a calculator. If you enter 2 + (3 × 4) from left to right, the machine will display 20 as the answer. If you enter (3 × 4) + 2, it will display 14 as the answer. Of course, 14 is the answer you want. In the first example, the machine added 2 + 3 and then multiplied by 4 to get 20. The child needs to recognize that the order of operation is as important with a calculator as with pencil and paper. This activity is designed to bring this difficulty to the student's attention and to teach him to check with pencil and paper when the order of operations may be a problem on a calculator. Many youngsters will be confused by the wrong answers they get to the first part of each example.

Try these on a calculator.

2 + (3 × 4) = _____	9 + (2 × 5) = _____
(3 × 4) + 2 = _____	(2 × 5) + 9 = _____
75 + (6 × 5) = _____	125 + (8 × 4) = _____
(6 × 5) + 75 = _____	(8 × 4) + 125 = _____
215 + (7 × 6) = _____	512 + (3 × 7) = _____
(7 × 6) + 215 = _____	(3 × 7) + 512 = _____

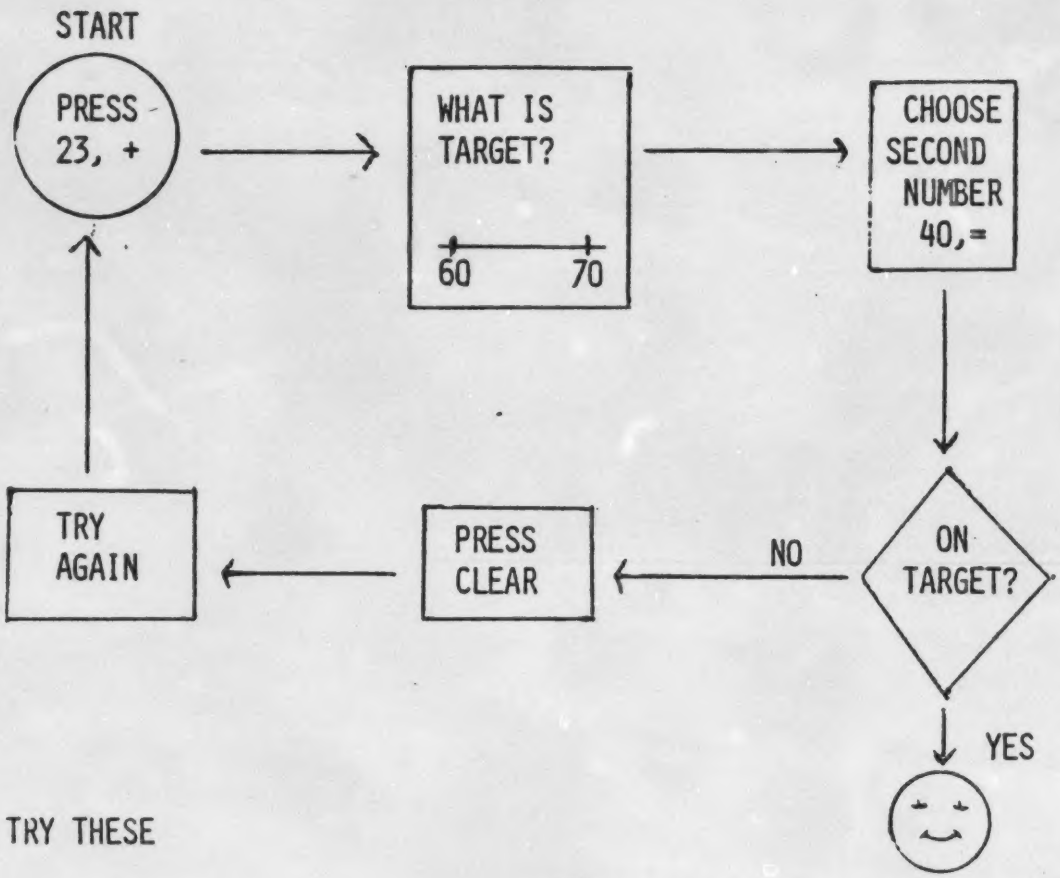
Check your answers with pencil and paper. Circle the problems you did correctly with the calculator. Why are some incorrect?

Can you find a way to do these on the calculator?

9 + (3 × 5) 25 + (7 × 6) 145 + (8 × 7)

Instructor G. Immerzeel

HIT THE TARGET



NOW TRY THESE

PRESS 50, +, TARGET 80 90

PRESS 33, + 60 70

PRESS 95, + 120 130

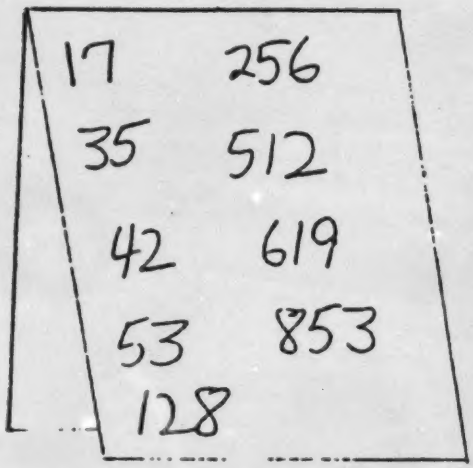
PRESS 178, + 205 210

PRESS 347, + 540 550

PRESS 47, + 810 820

Try This Game

1. Take turns.
2. Pick two numbers from the sign.
3. Add the numbers.
4. Cover the answer on the game board with your marker (slips of paper marked □ or ○ work well).
5. First player to get four markers in a straight line wins.



Game Board

95	636	88	145	672	654
52	170	895	291	529	181
981	554	273	309	888	298
135	565	547	1109	870	59
77	640	906	661	747	1472
384	1131	70	875	163	768

ROUNDING DECIMAL FRACTIONS

Round each decimal to the place given and push ⊞ . Check with the *check number.*

Round to hundredths .□ □

0.613	1.625	2.1407281
0.748	4.157	5.6142831
0.063	4.845	21.034174
0.197	17.103	3.0556715
0.296	9.362	2.5554128
Check Number 1.92	Check Number 37.10	Check Number 34.40

Round to thousandths .□ □ □

0.3333333	2.6666666
0.6666666	0.7142857
0.1666666	1.7777777
0.8333333	0.1875142
0.7777777	0.0526315
Check Number 2.778	Check Number 5.400

13.417819	14.285712
0.1431515	0.031252
6.666666	6.1381666
9.0909090	3.1702170
2.8181818	5.5555555
Check Number 32.137	Check Number 29.181

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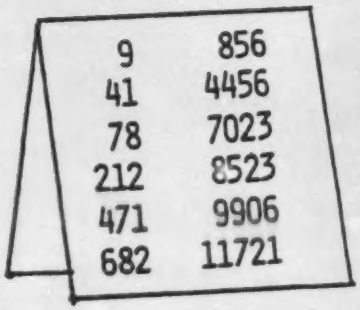
GETTING THE RIGHT ANSWER

CLASS

GAME



9	856
41	4456
78	7023
212	8523
471	9906
682	11721

DIRECTIONS

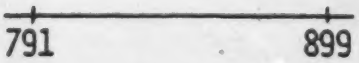
1. THE TEACHER WRITES TWO OF THE NUMBERS FROM THE SIGN ON THE CHALKBOARD AND DECIDES TO +, -, x, OR ÷ .

2. EACH PLAYER ESTIMATES THE ANSWER

3. THE TEACHER FINDS ANSWER ON THE CALCULATOR AND DECIDES ON AN INTERVAL FOR 2 POINTS AND AN INTERVAL FOR 1 POINT.

   EXAMPLE: 212 + 682 = 694

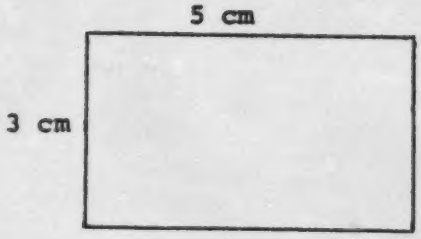
   2 POINT INTERVAL

   1 POINT INTERVAL

4. PLAYERS KEEP TRACK OF THEIR OWN SCORE.

ESTIMATING AREAS OF RECTANGLES



1. THE RECTANGLE ON THE LEFT IS 5cm LONG AND 3cm WIDE. ITS AREA IS _____cm^2.

2. FILL IN THE FOURTH SIDE OF THE RECTANGLE ON THE RIGHT SO THAT IT HAS THE SAME AREA. MAKE YOUR BEST ESTIMATE.

3. MEASURE THE SIDES OF THIS RECTANGLE.
   LENGTH = _____cm WIDTH = _____cm AREA = _____cm^2

4. IF THE AREA OF YOUR RECTANGLE IN #3 IS NOT WITHIN $1cm^2$ OF THE RECTANGLE ON THE LEFT, ERASE THE SIDE YOU DREW AND TRY AGAIN.

BASIC MULTIPLICATION FACTS

Beat the Calculator

Take turns playing. The player with the calculator says a basic fact.
The other player writes down the answer under ☺.
If the answer is wrong or you get the answer on the calculator first,
the other player writes the correct answer under ☹.

Game 1		Game 2		Game 3	
☺	☹	☺	☹	☺	☹
___	___	___	___	___	___
___	___	___	___	___	___
___	___	___	___	___	___
___	___	___	___	___	___
___	___	___	___	___	___
___	___	___	___	___	___
___	___	___	___	___	___
___	___	___	___	___	___
___	___	___	___	___	___
___	___	___	___	___	___

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I NEED A JOB LIKE THAT!

Mr. Pennypusher, I have a 20-day job for you to do, but I cannot pay you very much.

That's ok, Mr. Pushover. How about paying me 1 penny the first day, 2 pennies the second day, 4 pennies the third day, 8 pennies the fourth day, and so on for the 20 days?

Sounds like a good deal to me.

Yes, it is a good deal.

For me! Ha! Ha!

Fill in this chart of earnings for Mr. Pennypusher. Use a calculator to get each day's wages and the total earnings for all 20 days.

DAY	EARNINGS	DAY	EARNINGS
1	$.	11	$.
2	$.	12	$.
3	$.	13	$.
4	$.	14	$.
5	$.	15	$.
6	$.	16	$.
7	$.	17	$.
8	$.	18	$.
9	$.	19	$.
10	$.	20	$.
TOTAL FOR 20 DAYS	$.		

a) What is the average amount Mr. Pennypusher made per day? (Divide the total earnings by 20.)

_____

b) If he worked 8 hours per day, what is the average amount he made per hour?

_____

c) How much did Mr. Pennypusher average per minute?

_____

(d) If you were paid as much as Mr. Pennypusher averaged per minute, how much would you make for the time you are in your mathematics class?

per day? _____

per week? _____

per school year?

G. Immerzeel
E. Ockenga

Calculator Activites for the Classroom

CROSSNUMBER PUZZLE I

Across:

1) 2584 + 4499

3) 9806 − 3147

6) 134 + 96 + 85 + 112 + 75

7) 5892 − 5320

10) 1002 − 985

11) 1602 − 1568

12) 89 + 275 + 56 + 55

13) 8246 − 8047

14) 217 + 153 + 190 + 289

15) 12608 + 876 + 2011 + 24119

18) 54821 − 40061 = _____

20) 25 + 39 + 76 + 67 = _____

21) 217 + 176 + 139

24) 874 − 726 = _____

27) 58591 + 30172

29) 945 + 873 + 926 + 677 + 846

30) 373 + 629 + 288 = _____

Down:

2) 12589 + 14463 + 5662

3) 91567 − 26276

4) 114 + 203 + 199 + 159

5) 227 + 364 + 243 = _____

8) 2754 − 2105 = _____

67

Creative Publications, Inc.

G. Immerzeel
E. Ockenga

Calculator Activites for the Classroom

Down:

9)
```
  36
  48
  29
  37
+ 23
```

16)
```
  141
  108
  112
  176
+ 68
```

17)
```
  3946
  9895
  3446
```

19)
```
   88,035
- 42 604
```

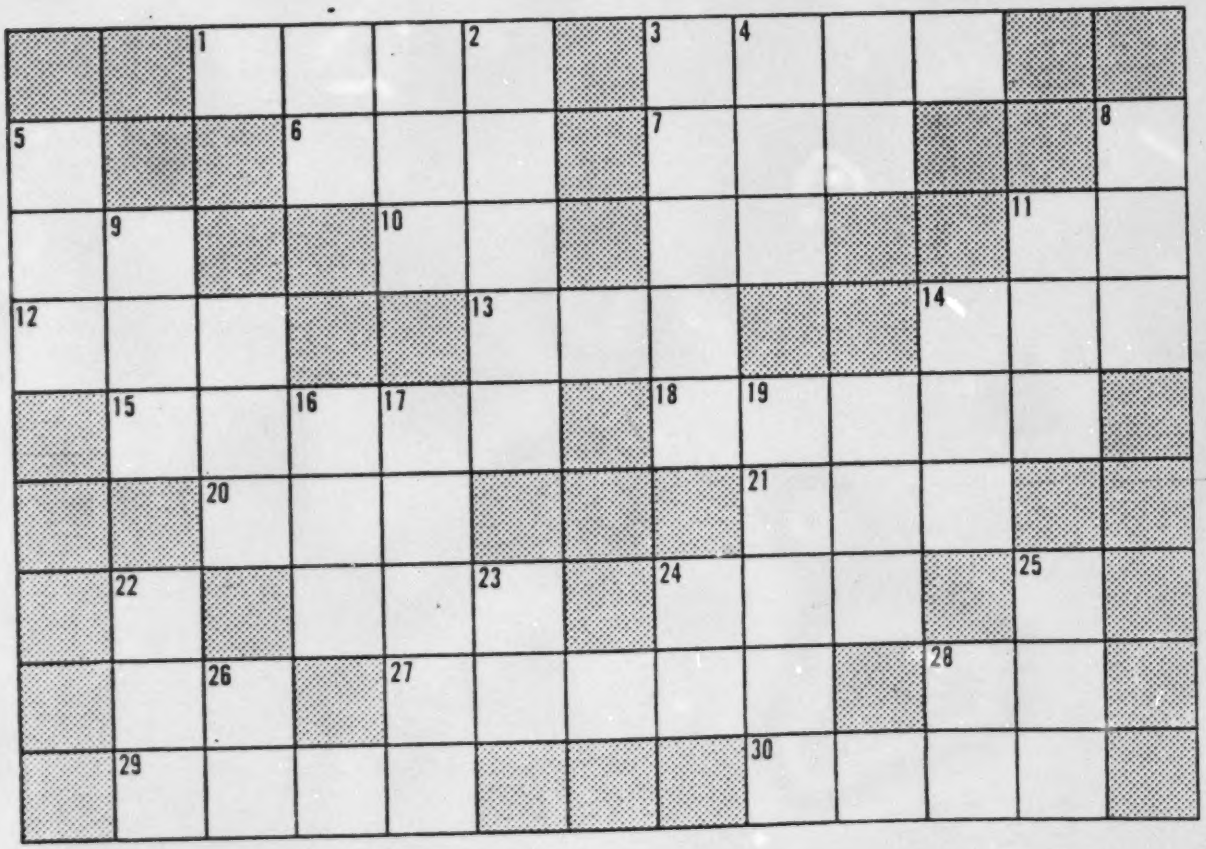
22) 1776 − 972 = _____

23) 17 + 24 + 19 + 28 = _____

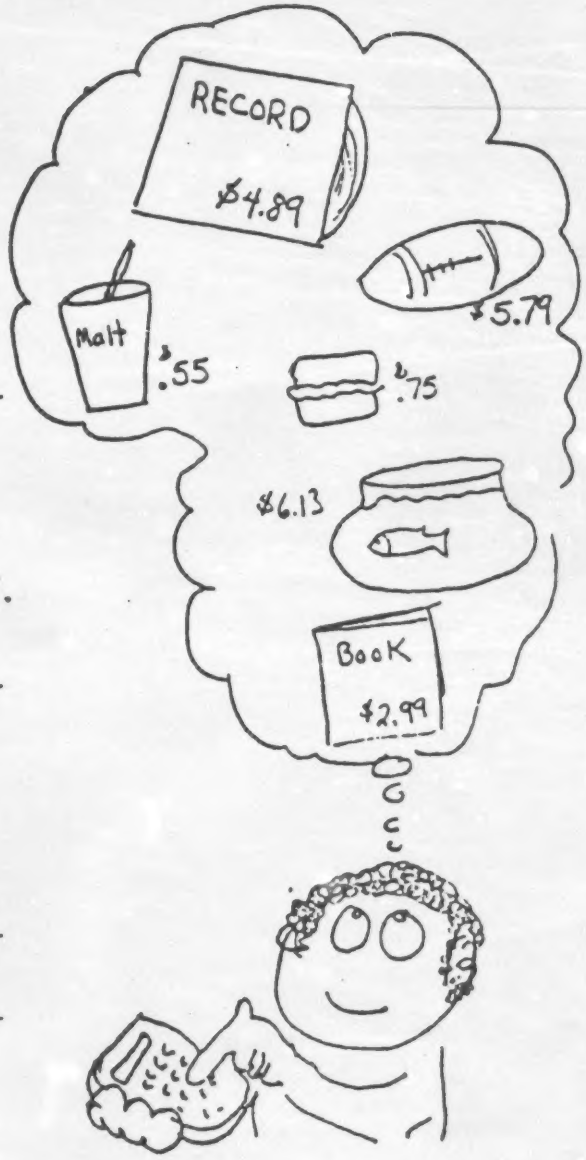
25) 1393 − 763 = _____

26) 518 − 426 = _____

28) 8 + 17 + 14 = _____



SHOPPING



1. YOU HAD $10.00
   YOU BOUGHT A

   WHAT IS YOUR CHANGE? _____

2. YOU HAVE $5.00
   NAME THREE THINGS YOU CAN BUY.

   _____ _____ _____

3. YOU HAVE $10.00 NAME PAIRS
   OF THINGS YOU CAN BUY.

   _____ _____ _____

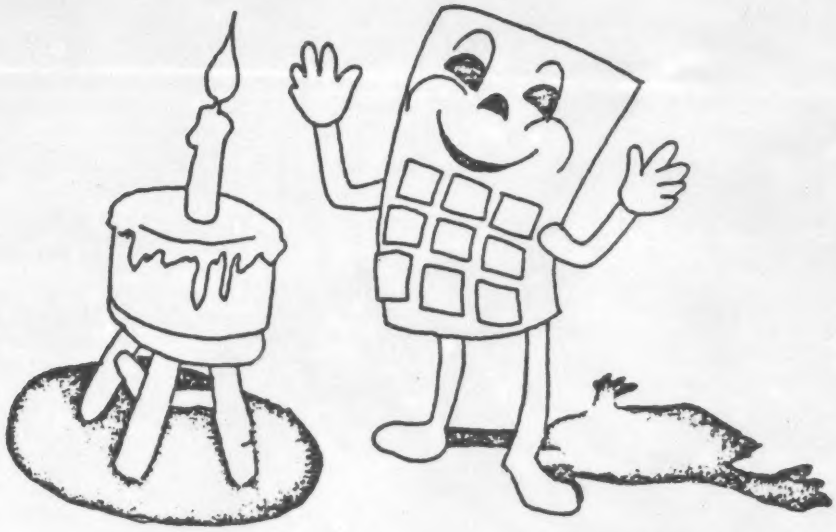
   _____ _____ _____

4. YOU HAVE $5.00. YOU NEED
   TO SAVE $1.50.
   WHAT IS THE <u>MOST</u> YOU CAN BUY?

   _____

HOW OLD ARE YOU?

TAKE YOUR AGE AT YOUR LAST BIRTHDAY (IN YEARS) AND FIGURE ON THE CALCULATOR THE FOLLOWING INFORMATION.



1. THE NUMBER OF DAYS YOU'VE BEEN ALIVE _____

2. THE NUMBER OF HOURS YOU'VE BEEN ALIVE _____

3. THE NUMBER OF MINUTES YOU'VE BEEN ALIVE _____

4. THE NUMBER OF SECONDS YOU'VE BEEN ALIVE _____

   IF YOU WERE 2 YEARS OLD WOULD THE ANSWER SHOW ON THE DISPLAY ? _____
   HOW ABOUT 3 YEARS OLD? _____ 4 YEARS OLD? _____

5. IF YOU WERE 13 YEARS OLD AT YOUR LAST BIRTHDAY HOW MANY HOURS WOULD YOU HAVE LIVED?

   _____

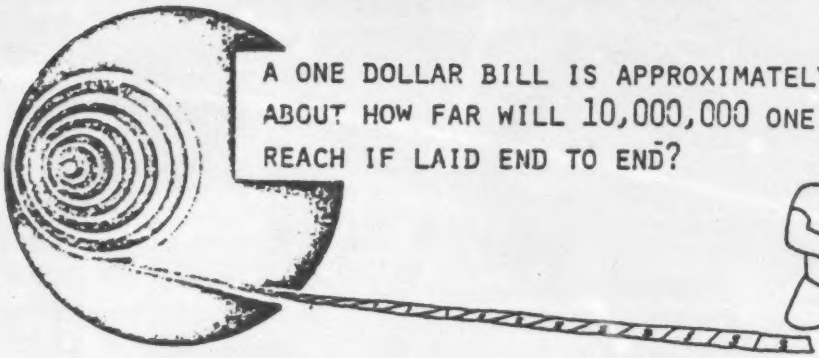
6. IF YOU LIVE TO BE EXACTLY 90 YEARS OLD, HOW MANY DAYS WILL YOU HAVE LIVED?

   _____

7. IF A DOG LIVES TO BE 10 YEARS OLD BY OUR CALENDAR AND EACH OF OUR YEARS IS EQUAL TO 7 DOG YEARS HOW MANY DOG YEARS WOULD THE DOG HAVE LIVED?

   _____

STRETCHING YOUR DOLLARS



A ONE DOLLAR BILL IS APPROXIMATELY 15.5 CM LONG. ABOUT HOW FAR WILL 10,000,000 ONE DOLLAR BILLS REACH IF LAID END TO END?

HOW MANY DOLLAR BILLS WOULD YOU NEED TO STRETCH FROM:

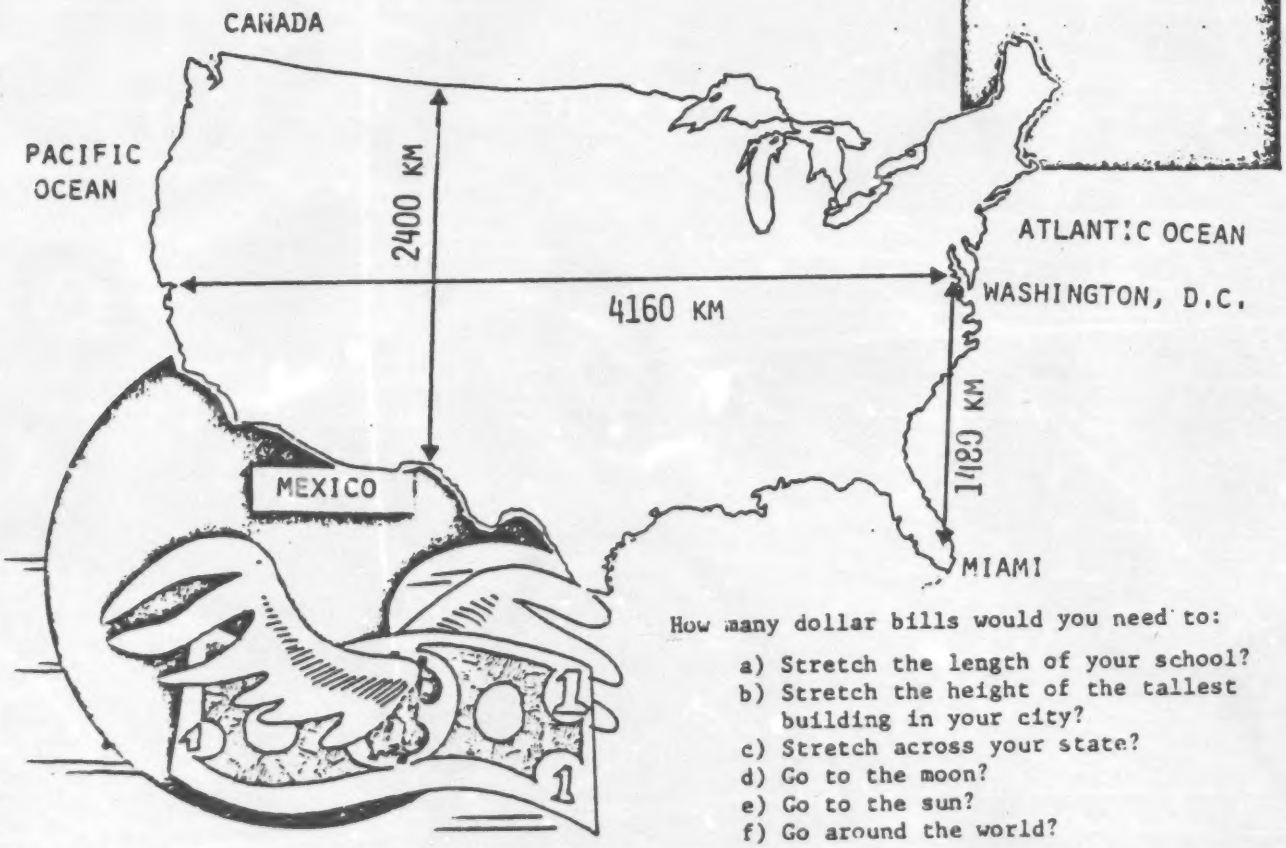
_____ CANADA TO MEXICO?

OR

_____ PACIFIC TO ATLANTIC?

OR

_____ MIAMI TO WASHINGTON?



How many dollar bills would you need to:

a) Stretch the length of your school?
b) Stretch the height of the tallest building in your city?
c) Stretch across your state?
d) Go to the moon?
e) Go to the sun?
f) Go around the world?

THAT'S JUST ABOUT THE SIZE OF IT!

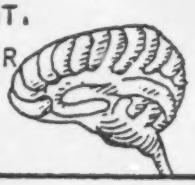
Application

1. MUSCLES MAKE UP ABOUT .4 OF A PERSON'S BODY WEIGHT. ABOUT HOW MUCH DO YOUR MUSCLES WEIGH?

2. YOUR INTESTINES (LARGE & SMALL) ARE ABOUT 7.5 M (25 FT.) LONG. HOW DOES THIS COMPARE WITH YOUR HEIGHT?

3. YOUR BODY CONTAINS 206 BONES. APPROXIMATELY .14 OF YOUR BONES ARE IN YOUR HEAD. ABOUT HOW MANY BONES ARE IN YOUR HEAD?

4. A PERSON'S BRAIN IS .02 OF HIS BODY WEIGHT. HOW MUCH DOES YOUR BRAIN WEIGH?

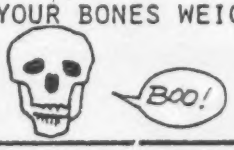


5. YOUR HEART BEATS ABOUT 80 TIMES A MINUTE. HOW MANY TIMES DOES IT BEAT IN A DAY?

6. THE HUMAN BODY IS ABOUT .6 WATER. HOW MANY POUNDS (KG) OF WATER ARE THERE IN YOU?

7. THE LARGEST GLAND IN YOUR BODY IS THE LIVER. IN A 160 LB (72.5 KG) PERSON THE LIVER IS ABOUT .03 OF THE BODY WEIGHT. HOW MUCH DOES IT WEIGH?

8. HUMAN BONES MAKE UP ABOUT .18 OF A PERSON'S TOTAL BODY WEIGHT. HOW MUCH DO YOUR BONES WEIGH?



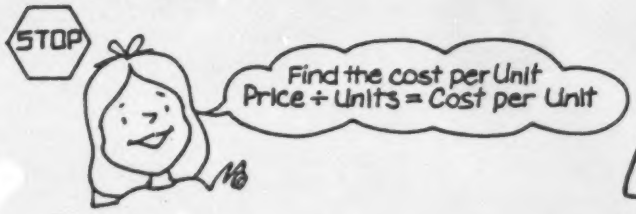
9. THE EYE BLINKS ABOUT 25 TIMES EACH MINUTE. APPROXIMATELY HOW MANY TIMES DOES IT BLINK IN A DAY?

10. THE BODY OF AN ADULT CONTAINS APPROXIMATELY 5 QUARTS (4.75 LITRES OF BLOOD. A BLOOD DONOR USUALLY GIVES 1 PINT (.475 LITRES). WHAT FRACTION OF HIS BLOOD DOES A DONOR GIVE?

COMPARATIVE PRICING

Which is the Best Buy?

Circle your choice.



Detergent

32 oz.
$.89

16 oz.
$.49

Tuna

6 oz.
49 cents

8 oz.
69 cents

Frozen Juice

12 oz.
39 cents

8 oz.
25 cents

Dog Food

5 pounds
89 cents

25 pounds
$4.25

Peanut Butter

18 oz.
79 cents

30 oz.
$1.49

Beans

28 oz.
83 cents

9 oz.
$.39

A fun activity is for the students to get some real prices from grocery stores and find the best buys.

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SOLVING EQUATIONS

SOLVE EACH EQUATION GUESS AND CHECK

1. 15 + ☐ = 29
2. ☐ + 43 = 126
3. 25 - ☐ = 16
4. 54 - ☐ = 31
5. ☐ - 15 = 35
6. ☐ - 28 = 14
7. 29 + ☐ = 40
8. ☐ + 80 = 100
9. 30 - ☐ = 15
10. 100 - ☐ = 10
11. ☐ - 40 = 40
12. ☐ - 70 = 70
13. 60 + ☐ = 60
14. 60 - ☐ = 60

FINDING PATTERNS

FIND THE MISSING NUMBERS

5	8	11	___	17	___	23	___	___	
9	14	19	___	29	___	___	44	___	___
34	40	46	___	58	___	70	___	___	
12	24	36	___	___	72	___	___		
50	75	___	125	___	175	___	___		
11	49	___	___	163	___	___	___		
10	___	___	___	50	60	___	___		
127	130	133	___	139	___	___			

IN THIS GAME THE PLAYER MAY

CHOOSE FROM | 1, 2, 3, 4, 5, 6, 7, 8, OR 9 |

PLAYER NO.1

PRESSES

3, +

PLAYER NO. 2

PRESSES

4, +

PLAYER NO. 1

PRESSES

8, +

PLAYER NO. 2's

TURN

THE PLAYER TO GET 30 WINS
TAKE TURNS BEING THE PLAYER TO START.

Nim

S. Thiagarajan

Games With the Pocket Calculator

H. D. Stolovitch

Here's an exciting way to play this popular numbers game. For those who don't know how to play NIM, you take turns to add numbers five or less to a running total. The player who reaches the total of 25 wins the game.

Technically, NIM is a "trivial" game in which the first player always wins if he makes the right moves. This is just the game for you to beat the champ.

NUMBER OF PLAYERS: Two.

APPROXIMATE TIME REQUIREMENT: Three to five minutes.

SKILLS INVOLVED: Simple addition. Ability to induce a formula for consistently winning the game.

CHANCE FACTOR: No chance is involved if you know the system.

PLAY OF THE GAME:

(1) The first player enters 1, 2, 3, 4, or 5 in the calculator.

Toby is the first player. She enters a one and presses the plus key.

(2) Players take turns adding any number from 1 to 5 to the number on display.

Stan adds a three to the one and gets a total of four. From this point on, the game proceeds as follows:

PLAYER'S MOVE	*NEW TOTAL*
Toby adds 3.	*7*
Stan punches in 2 more.	*9*
Nonchalantly, Toby adds 4.	*13*
Stan meditates briefly, then adds 5.	*18*
Toby senses victory... and carefully adds 1.	*19*

(3) The game ends whenever the total reaches 25. The player who arrives at this total is the winner.

At this stage of the game, Stan is stuck. He cannot make the 19 become a 25 because he may not add a number greater than five. Whatever other number he adds, Toby can come up with the clincher. For example, if he adds one, she adds five; if he adds two, she adds four, and so on.

(4) The second player in the previous game begins the next game.

Stan enters the first number to begin the next game. He chose the number five. Here's how the game goes:

STAN	*TOBY*	*NEW TOTAL*
5		*5*
	2	*7*
5		*12*
	1	*13*
3		*16*
	3	*19*

Stan is stuck again. Obviously reaching the number 19 is a part of the system!

S. Thiagarajan
H. D. Stolovitch

VARIATIONS:

You can change both the total number to be reached and limit for the numbers added during each turn. For example, you can try to reach a total of 365 using any number less than 30.

WINNING STRATEGY:

If you play the game repeatedly, you will probably figure out how to win it every time. In case you are in a hurry to show off to your friends, here's the system:

(1) If you are the first player, begin with the number one.

(2) Subtract whatever number your opponent adds from six. When it is your turn to add, use this difference. (If your opponent adds a 1, you add 5 [i.e., 6–1]. If your opponent adds a 2, you add 4 [i.e., 6 – 2]. And so on . . . .)

(3) If your opponent begins the game, watch out for these intermediate totals: 7, 13 and 19. Try to arrive at them during any convenient round in the game. From then on, you can win the game by using the second strategy move above.

For more advanced players here's the formula for winning NIM with any other target total and added restrictions:

(1) If N is the target total and n is the number you may not exceed during each addition, then find N/(n + 1). Disregard the quotient; the remainder you get is the number to begin the game with. For example, if you are trying to reach 73 by adding any number from 1 to 9, then N = 73 and n = 9.

$$N/(n+1) = 73/10$$

$$\begin{array}{r} 7 \\ 10\,\overline{)\,73} \\ \underline{70} \\ 3 \end{array} \leftarrow \text{remainder}$$

You should begin this game with 3.

(2) Subtract the number your opponent adds from (n + 1). The difference you get is the number you should add. If your opponent adds 3, you should add 7 (i.e. 10 – 3). If your opponent adds 6, you add 4.

(3) If you subtract multiples of (n + 1) from N, you get the intermediate totals to shoot for if your opponent begins the game. For N = 73 and n = 9, the intermediate totals you should shoot for are 63, 53, 43, 33, 23, 13 and 3. Once you reach any of these numbers, you can win! Simply apply the second strategy listed above.

MORE VARIATIONS:

(1) Play NIM so that the first person to reach or exceed the target number loses.

(2) Many NIM type games can be invented by using different rules for choosing the number a player may add during his move. Suppose the first player to reach *or exceed* a target number N wins (or loses – take your pick). Here are several ways to restrict a *single-digit* number a player can add during his turn. Pick one and play!

THE BIG ZERO

RULES

1. FOR TWO PLAYERS OR A SMALL GROUP. FIND THE SECRET NUMBER.

2. ONE PLAYER PRESSES A SECRET NUMBER, -, =, =, AND PASSES THE CALCULATOR TO THE OTHER PLAYER.

3. THE OTHER PLAYER MAY ENTER A NUMBER FOLLOWED BY =, TRYING TO GET 0 TO SHOW ON THE DISPLAY.

4. THE NUMBER PRESSED TO GET 0 IS THE SECRET NUMBER.

5. CAN YOU FIND OTHER PLAYER'S SECRET NUMBER?

NAME_____

Example: For each pair of words below place an X on the blank that best tells how you feel about--

SNOW

like ____:____:____:____:____ hate
cold ____:____:____:____:____ hot
work ____:____:____:____:____ play

Directions: For each pair of words below place an X on the blank that best tells how you feel about--

MATH

bad ____:____:____:____:____ good

sad ____:____:____:____:____ happy

boring ____:____:____:____:____ exciting

jump in ____:____:____:____:____ hold back

hard ____:____:____:____:____ easy

more ____:____:____:____:____ less

NAME_____

Example: For each pair of words below place an X on the blank that best tells how you feel about--

SNOW

like ____:____:____:____:____ hate
cold ____:____:____:____:____ hot
work ____:____:____:____:____ play

Directions: For each pair of words below place an X on the blank that best tells how you feel about--

CALCULATORS

bad ____:____:____:____:____ good

sad ____:____:____:____:____ happy

boring ____:____:____:____:____ exciting

jump in ____:____:____:____:____ hold back

hard ____:____:____:____:____ easy

more ____:____:____:____:____ less

Directions: Read each question and fill in the space below your answer.

1. Is there at least one calculator in your home?

YES ◯ NO ◯

2. Are you allowed to use a calculator at home?

YES ◯ NO ◯

3. Do you think you would do better in math if you used a calculator?

YES ◯ NO ◯ DON'T KNOW ◯

4. Do you have a calculator of your own?

YES ◯ NO ◯